Group report

INF2260

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Bookworms

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1. Introduction

1.1 Group description

We are a group of five people: Hilde Bakken Reistad, Jeongyun Choi, Lena Drevsjø, Saq Imtiaz and Therese Slang. While the entire project has been teamwork with everyone contributing in various areas, we all have our own particular strengths. Hilde has a background in pedagogy and adds particular value to the group in ensuring a focus on learnability in our design. Lena has prior experience with long term and large scale data gathering and has provided valuable insight into how best to organize our data gathering and analysis. Therese has a creative background and ensures that we are always open to new ideas and not restricting ourselves to one train of thought. Jeongyun's background in convention management means that she helps keep us organized and on track with regards to our project plan. Saq has prior experience with user centered design and prototyping and adds technical strength to the team.

1.2 Vision and goal

Vision: improve the user experience at the library.

Goal: make it easier to search for and locate books at the library.

When we chose the project, we considered how difficult it would be to work with users and how much we can cooperate with the client. We chose to work with Realfagsbiblioteket. Realfagsbiblioteket is the new science library at Blindern. The reason they made Realfagsbiblioteket is for students' convenience and to have a more organized system for all the science libraries which previously were geographically independent.

We felt it could be interesting and exciting to work with the library since they have essentially been static for many years without much innovation. However, we knew that the administration for this library was forward thinking and open to new ideas. Also, the library is the place which we use almost every day ourselves. We could also easily come up with more ideas about the place we use often. Furthermore, it is relatively easy to find library users as they are also students as we are (Lazar, Feng & Hochheiser, 2010). Lastly, we felt the library was a good client to work with as they were excited by the project and they had three dedicated staff members to work with the students. The possibility of having close communication and cooperation with the client throughout the project was one of the deciding factors.

We had weekly design workshops with the client, and at the first workshop we discovered what they want us to work with is; how to encourage students to make more use of the Realfagsbiblioteket and how to optimize the use of the library. We understood that what we need to focus on is the user experience at Realfagsbiblioteket. That is how we defined the initial vision of the project after the first workshop with clients.

With this vision in mind, we brainstormed ideas we had in order to narrow the vision down to a more specific goal. We shared experiences and we had from other libraries that we have used in Blindern and elsewhere, while also looking at common frustrations and innovation happening at libraries around the globe. The most commonly shared experience and frustration was that it is not as easy to search for and locate books at the library. This is also the most important experience at the library and at the same time the core function of it. At the first workshop, the client emphasized that they also want students to be made more aware of the electronic resources the Realfagsbiblioteket offers. We decided that there was potential for creating a solution that allowed users to more easily search for and locate both physical and e-books at the library. Therefore, our goal became to make it easier to search for both physical and e-books as well as locate physical books at Realfagsbiblioteket.

We carried out some user studies to investigate whether our users felt they needed a better solution for the problem of finding and locating books at the library, and to identify which platform (mobile phone, tablet, desktop) was best for such a solution. After discussions with the client and based on the data gathered from the library users, we concluded that the prototype would be a mobile app. The client wanted to have the prototype working on mobile devices. Most students have at least one handheld mobile device nowadays.

1.3 Design brief
Even though librarians think that it is not complicated to use BIBSYS system, it is not simple for some students to search for books on BIBSYS and locate them at the library. After the workshop with library staff (clients) and from our own experience of using the library, we decided to make a mobile app which makes it easier for all library users to search for and locate books (all the

materials which belong to the Realfagsbiblioteket including electronic resources, for example e-books) at Realfagsbiblioteket.

2. Project plan

We made a weekly plan taking two important deadlines into consideration. Firstly, we should have a high-fidelity prototype which works and can be demonstrated at the mid-term evaluation by October 22th. Secondly, the final report should be delivered by November 25th. Since the client was flexible and had no additional time constraints for the project timeline, this formed the basis of our project plan.

Week nr	Date	Plan
Week 35	August 30th	The first workshop with clients
Week 36	August 31-9th	Brainstorming
Week 37	September 10-16th	Data gathering (interview)+low-fidelity prototype
Week 38	September 17-23rd	Data gathering (questionnaire)+design alternatives
Week 39	September 24-30th	Data gathering (observation)+early high-fidelity prototype
Week 40	October 1-7th	Formative testing
Week 41	October 8-14th	Final high-fidelity prototype, final improvement
Week 42	October 15-21th	Mid-evaluation preparation (Summary of design process)
Week 43	October 22nd	Mid-term evaluation and presentation
Week 44	October 29th-4th	Plan user testing
Week 45	November 5-11th	User testing (summative testing)
Week 46-47	November 12-25th	Final report

Table 1: The project plan

In light of the tight schedule and limited time we had, the clients provided us with resources to facilitate data gathering sessions. They arranged meetings with librarians and offered some gift cards for participants to help us to recruit them easier. Thanks to the cooperation with clients, we

were able to perform the data gathering more efficiently. We tried to involve users as early as possible to obtain feedback on early-prototypes in order to avoid making unnecessarily big changes on the high-fidelity prototype later.

The project plan worked well without big delays. However we discovered that we needed to make extra effort by working on average 30 hours a week to meet the deadlines we had imposed on ourselves. It also helped that we practiced some aspects of agile development and were willing to be flexible with our plan when we needed to be. We did a lot of iteration by each deadline, and if it was necessary, we moved the deadline to allow us further time. Since we had worked together as a group last semester in INF1510, it provided us a more pleasant work atmosphere despite a stressful schedule.

3. Design process

3.1 User-centered design

Among the four main approaches to interaction design that Saffer (2010) suggests, our group chose user-centered design. In user-centered design, the user knows best and is the only guide to the designer (Rogers, Sharp & Preece, 2011). It requires focusing on the product's potential users from the very beginning and checking at each step of the way with these users to be sure they like and are comfortable with the final design (IBM, 2008). According to Saffer, our role as designers is to translate the users' needs and goals into a design solution.

The reason why we chose user-centered design as our main design approach is that the most important thing in our project is users' needs and goals. As we mentioned above, our vision is to make encourage students to make more use of Realfagsbiblioteket and make it easier to use with the assistance with our app. We as developers can gain a better understanding of users' goals, leading to a more appropriate, more usable product with user-centered design approach (Rogers et al., 2011). Therefore, the users were the center of attention in our project to achieve our goal.

3.1.1 Users

Before we started to work with users, we needed to define who would be using our app because it is crucial to involve the correct users for a successful user-centered design. According to Eason

(1987), there are three categories of user. Firstly our primary users - frequent hands-on users of the system - are students mostly in natural science. Secondary users, occasional users, are librarians and other staff working for Realfagsbiblioteket. Tertiary users who are affected by the introduction of the system are BIBSYS, the common library system for all of Norway and publishing companies for books.

3.1.2 Three principles of user-centered design

We followed the three principles of Gould and Lewis (1985) which are now accepted as the basis for a user-centered approach (Mao, Vredenburg, Smith & Carey, 2005). Firstly, we focused on the users and tasks early by observing users doing their normal tasks, studying the nature of those tasks, and involving users in the design process (Rogers et al., 2011). Secondly, we collected qualitative data by observing and analyzing the reactions and interactions of intended users to low-fidelity and early high-fidelity. Lastly, we repeated design-test-measure-redesign cycles as often as necessary for the design and development iteration.

3.2 Data gathering methods

To begin with we needed to verify that our vision was appealing to users, if there was a need for the solution we identified and to verify what platform it would be on we had to gather some data.

The first thing to find out is what kind of methods we wanted to use to gather data. We wanted to perform triangulation to ensure that the data we collected was valid. Triangulation means to employ different data gathering methods (Rogers et al., 2011). If you get the same results from the different methods you have used that means that the data is more valid than if you just used one method. Before each method we used a pilot-test to identify potential biases and improve the data gathering plan (Lazar et al., 2010).

3.3 Data gathering

3.3.1 Round one - Interview

The first round of data gathering started with us making some low-fidelity prototypes that we wanted to show the users. We also wanted to ask them if they used the library, what they used the library for and what kind of features they were interested in a possible app.

To be able to show this to the users we wanted to have an interview. Interviews have the ability to "go deep" and be very flexible, which gives you more qualitative data. We have used semi-structured interviews. When we use semi-structured interviews we ask questions already prepared, but the conversation can go aside from the question, which would be particularly good when it comes to the discussion about the prototype. The goal of semi-structured interviews was to get some extra insight and understanding of the user (Lazar et al., 2010).

We went to the library and had 7 semi-structured interviews (3 group interviews and 4 individual interviews), and the results were good, and not quite as expected. Everyone liked the idea of the app, and they were positive to most of the features; "favorites", "new books", "related books" and "map navigation". What they wasn't positive to was "sharing books", "price check" and "step by step navigation ". What we found interesting was that they liked the navigation with map and not the navigation with steps, that we thought was more interesting and a good idea. We also got other ideas from the users; to have it work on other libraries and to have opening hours in the main menu. From this feedback and analysis we decided that we needed more input on what features the users wanted, and if others also wanted the navigation with map instead of the navigation with steps.

3.3.2 Round two - Questionnaire

To be able to get data from a larger sample of the user group we decided that the best approach would be to make a questionnaire. The strength of questionnaires is the ability to get a large number of responses quickly from a population of users that is geographically dispersed (Lazar et al., 2010).

We made a questionnaire where we had questions about their habits when it comes to borrowing books from the library, what kind of platform they wanted it on, and more about what kind of features they wanted. 47 people answered the questionnaire. The results we got from that was that 47% never use Realfagsbiblioteket and 32% think that moderately difficult to find books on the library. Our conclusion from this was that as long as we can make it easier for someone to find books, that would be very useful Other results was that the users wanted to have the app on smart phones (83%). 50% wanted the navigation with map and 28% said both. For the other

features they were positive to "favorites", "related books", "price check", "events" and "opening hours".

After looking at these results and talk about what was able for us to do (in the group and with the library) and what the users wanted, we decided to make the app for android phones, do the navigation with map, favorites, opening hours. We also kept the "sharing books" feature because we did not think it would be too hard to do, and that we found it useful.

3.3.3 Round three - Interview

Since the librarians also are a part of the user group, we had interviews with them. We used a semi-structured interview here, and let them talk about things outside the question that they found important. This was to get the extra insight and understanding that we talked about earlier.

We wanted to know what they think is difficult about the system (BIBSYS) today, if they would use an app and what kind of features they would find useful. We interviewed two librarians and they both answered that they thought it was interesting and useful if as long as it was easy to use. To make the app easy to use was something we thought was really important for our app and thus learnability and memorability became two of our usability goals.

3.3.4 Round four - Observation

At this time we thought it would be smart to see how the students really use the library. To do this we wanted to observe them. Observation was used to understand the users' context, tasks and goals as well as current usage patterns. We used direct observation in controlled environment for this session. That means the user know he's being observed, and he's being observed in a setting we set up. This was because the details of the activities needed to be captured (Rogers et al., 2011).

We invited three of the same users we had interviewed before to this session. We gave them some tasks to see how they navigate at the University of Oslo (UiO) website pages and BIBSYS, and how they would find a book in the library. After that we asked them some questions about the difficulty in the tasks. We did this to get an idea on how students find books today.

The results were that they used different ways to find the same results, and some struggled more than others. That showed us the same thing as the librarians said that the app needs to be simple.

3.3.5 Round five – design suggestions

After the observation we showed the users some design suggestions for the app, and we also sent it by e-mail to two other users who we had interviewed earlier. We received five answers on the design alternatives. What we wondered was what design they wanted for the main menu screen, "search for books" screen, and how they wanted the search results to look like.

We followed the user's preferences in deciding which design to use, but for the main menu screen the responses were split. But, they all agreed that one of them was more suitable for the UiO profile and design, so we chose that one.

We also got some other tips from users: Be consistent on choice of language (Norwegian or English), 5-15 search results per page, advanced search function, English books in search results and icons on the top next to the text, so it will be more intuitive where you are in the app. We were not able to implement all of these tips, some because of BIBSYS, and some because of the time and other design limitations. What we were able to do was to make it 10 results per page in search, and make sure the app consistently uses English.

3.3.6 Round six – User based testing

At this point we had a high fidelity prototype and we wanted to show our app to the users. We wanted to do user based testing. This was a formative user based testing, which means a group of representative users attempting a set of representative tasks in order to improve the usability of the interface (Lazar et al., 2010). We asked an independent group to carry out the testing to minimize the possibility of investigator bias.

We created tasks so they could look at the different features in the app. What we wanted to know was if this app was what the users wanted, if they could understand it, and what was good and not so good.

After we analyzed the data we identified the following usability problems as needing to be fixed: make the search button larger, autocomplete should not jump out, there should be no reset button in the search field, and make a "how to use scan barcode" screen as it can be a bit confusing the first time the feature is used to know what to do. These are the problems we fixed before we later performed the summative usability testing.

4. Final high fidelity prototype

4.1 Architecture

Our high fidelity prototype was developed primarily for the Android platform, as it is open-source and therefore easier to develop for as compared to other popular mobile platforms. However, we choose an architecture for the app that is based on HTML5 and JavaScript, which is then packaged as a native app using the PhoneGap open-source library. Furthermore our HTML and JavaScript code was based on the open-source JqueryMobile library which has been designed for cross-platform operability, and provides a similar user experience regardless of platform. This architecture and development approach makes it possible to use the same core code for our application and easily package and deploy it to other platforms such as Apple iOS, Windows Mobile or Symbian with little additional effort. We have also ensured that our design is flexible and can adjust to moderate differences of screen size and still offer a good user experience.

To retrieve information about books at the library, the prototype utilizes the API (advanced programming interface) for BIBSYS, the central library database for all libraries in Norway. This was a non-functional requirement (Sommerville, 2010) for the project that we received from the client, as the library wanted our proposed design to be something that could realistically be implemented next semester. Our app works directly with the BIBSYS servers for querying the database and there are no other servers involved. All user data is saved only on the user's phone use secure storage that is not accessible from other apps, thus protecting the user's privacy.

Working with the BIBSYS API presented some technical challenges as only a small subset of the functionality available through the regular BIBSYS website are exposed through the API. Furthermore, we discovered that while the API does provide authentication functionality and the possibility of allowing a user to loan books and renew loans, the authentication is not secure. The

authentication mechanism uses a HTTP GET request with the username and password in unencrypted text, which is not safe and potentially gets cached by browsers and ISPs even if using the HTTPS protocol. As it was of paramount importance to us that our user's privacy be maintained and their user credentials not be at risk of being compromised, we decided to avoid all features that would require authentication. This security issue has been reported to BIBSYS and we are hopeful that this will open the door to implementing features that involve authentication at a future time.

Another non-functional requirement was that the design should adhere to the guidelines set forth in the University of Oslo design manual (UiO, 2012) in order to achieve a visual presentation that is coherent with the design used by other university resources. Amongst other things the design manual dictates the colors that can be used, the size and positioning of the logo, as well the choice of font.

4.2 Design principles

In the design of our app we paid careful attention to the design principles of consistency, feedback and affordance (Lazar et al., 2010), as well as Nielsen's ten heuristics for user interface design (Nielsen, 1994).

The design principles of visibility, consistency, feedback, affordance and constraints are commonly used by interaction designers to aid their thinking when designing for the user experience. In practice applying these design principles usually involve a level of compromise and trade-offs (Lazar et al., 2010). We chose to prioritize affordance, consistency and feedback as these principles contribute to an interface that is easy to learn (learnability) and remember (memorability), which was one of our key usability goals (Lausen & Younessi, 1998). Therefore we focused on creating an aesthetic and minimalist design without extraneous information or unnecessary visual clutter, to increase the visibility and affordance of our key features (Nielsen, 1994).

Nielsen's heuristics are ten general principles for user interface design that are based on a factor analysis of usability problems. Applying these heuristics to our design allowed us to avoid common usability pitfalls (Nielsen, 1994).
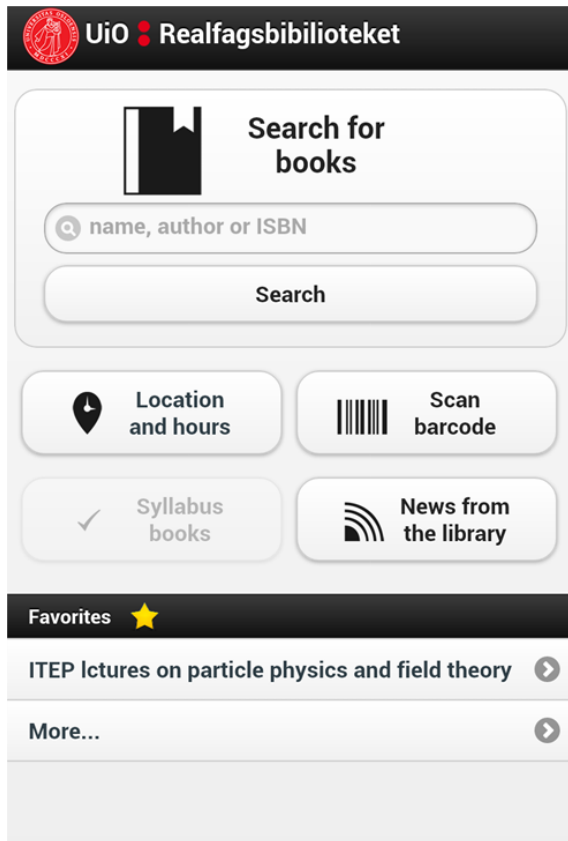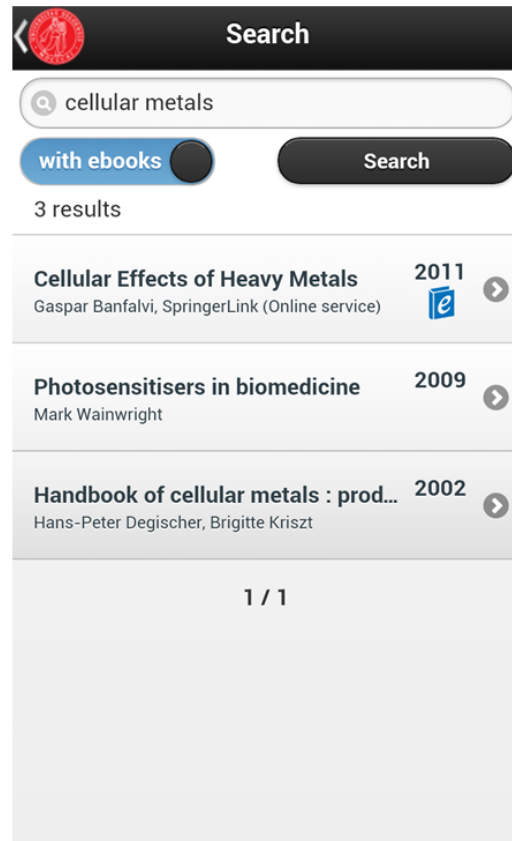
Figure 1: Screenshot of main screen screen.

Figure 2: Search result screen of the app.

4.3 Our design

We also focused on the usability goals of utility and effectiveness (Rogers et al., 2011), which in this context meant that the app needed to be useful and effective in helping users search for books. As such, the main functionality offered by the app is the ability to search for books and locate them in the library. We emphasized the affordance and visibility of this feature and made the search field central to the design and layout of the main screen of the app, and by making it larger than other buttons (see figure 1).

Amongst the key usability issues we identified with performing searches using the existing website search feature for the library, were the complex and confusing search options, and difficulties with typing long book title. Therefore we implemented a simplified search field which accepts either author names, ISBN numbers or book titles, as well partial book titles. Since the difficulties with typing book titles correctly are further exacerbated by the relatively small size of keyboards on mobile phones, we implemented an auto-complete feature to reduce

the typing required and the risk of associated errors as it is best practice to prevent errors where possible (Nielsen, 1994).

As yet another alternative for data-entry and facilitating searching for books, a feature was added which allows a user to scan a barcode and thus search for it in the library. In situations where the user has access to a physical copy of the book - as at a bookstore - and wishes to check if it is available at the library, this allows for a quick and error-free alternative to typing book titles. However, we discovered that some users encountered some difficulties the very first time they used the scan feature, and were not entirely sure as to what they needed to do. Therefore we added a help screen with instructions which is shown the first time a user chooses to scan a book, which guides the user through the process. As Nielsen (1994) suggests, even though it is better if a system can be used without documentation or help, it should be provided when necessary.

For each button on the main menu of the screen, intuitive icons were carefully designed which give an affordance as to the underlying functionality (see figure 1). This is also makes it easier for users to learn and remember how to use the app, by relying on recognition rather than recall and reducing the user's memory load (Nielsen, 1994).

Our vision for the design of the main screen also incorporated features being developed by other student groups - such as booking group rooms or finding syllabus books - to create a cohesive design for an app for the library. However these features were hidden or disabled to facilitate testing with users, so they would not be confused and distracted by features which did not work.

To make sure that the user is always aware of the system status we ensured that feedback is provided for each action a user performs in the app. This includes a loading indicator - when waiting to load data from the BIBSYS API before the next page can be presented - and highlighting of buttons when they are pressed.

The app allows users to search for both physical books at the library as well as e-books. To provide affordance to users as to which type of book is available, the search results for e-books use an intuitive blue e-book icon. Users are also able to use a toggle to choose whether or not to include e-books in their search results (see figure 2).
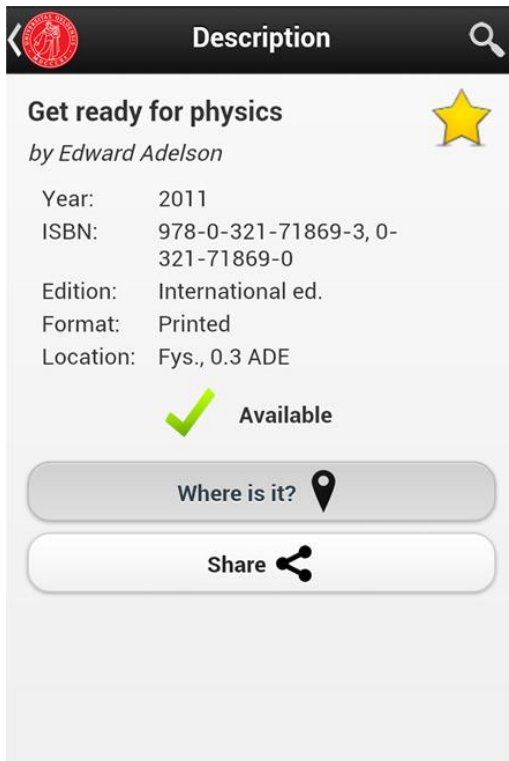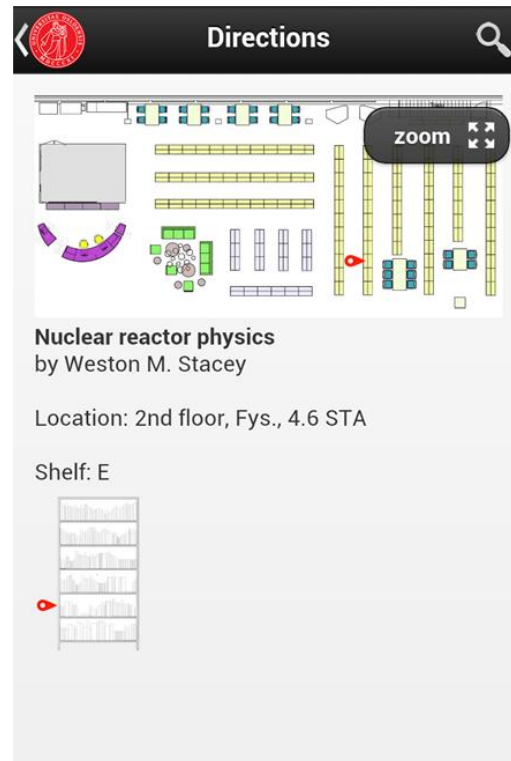
Figure 3: Book details screen

Figure 4: Book location map screen

Ensuring that our design is consistent and meets with the user's expectations in terms of behavior was also a high priority. Since our primary focus at this time was the Android platform, we focused our design around creating a cohesive and familiar experience for users of existing Android apps, and as such studied many Android apps and made extensive use of Android design patterns. The design of the book details screen in the app (see figure 3) is a good example of this. The university logo in the top right hand corner is a button that takes the user to the main screen, and provides affordance of this by means of the white arrows symbol to the left of it, a common design pattern in Android apps. Similarly the placement and design of the search icon in the top right hand corner, the use of a star icon to add a book as a favorite and the share icon are all Android design patterns that are widely used and which users are already familiar with. This ensures that our design is familiar for users, and easy to learn. Furthermore, we used easily recognizable and visible icons and text to provide feedback and affordance to users as to whether a book is visible or not. The icon used for the map function is also consistent with the icon used on the main page of the app, ensuring a coherent and predictable user experience.

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We have also taken into account users with visual impairments where feasible. For instance our color choices have taken into account users with color blindness and ensure that they will have sufficient contrast and the text will be legible for them. Following the same vein of thought, we designed the map feature for locating books such that it is possible to zoom in and see a larger version of the map (see figure 4). We provided affordance of this feature by using another intuitive icon indicating zoom functionality.

Users are also able to save books as favorites and easily find them again. As previously mentioned the ability to save a book as a favorite is afforded by the star icon on a book details screen, and is a design pattern that is intuitive and familiar for Android users. Furthermore the three latest favorites are visible on the main screen of the app, along with a "More..." option which brings up a list of all of the favorites (see figure 1). Users are able to delete favorites here as well as search within the favorites, which can be convenient if they have many favorites. As discussed earlier, user privacy is ensured by saving all data about favorites in secure storage on the user's phone.

Last but not least, the main screen provides access to a "Location and hours" feature added due to specific requests from our users, which provides information about the location and opening hours of the library. To make it easier for new users to locate the library, a map is provided which can interact with the intrinsic Android maps app and allow users to obtain step by step directions.

Since our prototype interacts with the same BIBSYS database used by all libraries in Norway, the scope of the project could in the future extend much farther than just the Realfagsbiblioteket at Blindern.

4.4 Limitations and suggestions for further development

Currently the map system in the prototype has been implemented only for the Physics section of the library and is a static database that cannot easily be updated to include new books. This was a compromise made in light of the limited time and resources available for the project. There are existing software solutions which allow libraries to create more dynamic databases of books and show the locations of books on a map, such as the one used by the main library at the University of Oslo. However, these solutions are currently available for desktop computers only, and since

the Realfagsbibilioket is still new they have to yet to implement it. Ideally once they have implemented such a system, it would be integrated with the app.

The app should also be translated into multiple languages, at least Norwegian in addition to the current language which is English. We chose English as the language of our prototype since there are foreign students at the university that we wanted to accommodate and English is a common language spoken by all.

The autocomplete implementation when typing in book titles is also suboptimal, as it does not accurately match all book titles which are in the BIBSYS database. Since this is a functionality which depends on adequate and accurate support from the database server, a request for improvement should be passed on to the vendor (BIBSYS).

Perhaps most critically, the current behavior of the app does not accommodate and correct for common spelling mistakes. Therefore even a slight misspelling in a title leads to the book not being found. This is a big usability problem as long titles are difficult to type on a mobile phone. However, once again, an optimal solution would require support from the BIBSYS server to check for common spelling mistakes and attempt to match titles despite them.

Other potential improvements include adding options for sorting the search results by author or year, as well as the ability to search for books by subject or topic.

5. Evaluation of high fidelity prototype

During this project we have carried out formative usability testing with users several times during the development of the low and high fidelity prototypes. It has been an ongoing iterative process to ensure we identified and fixed usability issues in order to provide a great user experience to users of our app. This chapter will describe the summative usability test.

5.1 Summative usability test

Our goal for our evaluation was to improve the quality of the interface by finding flaws. We wanted to focus on finding flaws that could cause problems for a majority of users and at the same time we wanted to investigate what was working well.

Our app is a fully working prototype. As Lazar et al. (2010) suggests, usability testing is a good method when the goal is to improve the interface of the prototype. It is not as good to use usability testing if you are interested in comparing different solutions. For comparing two different solutions, experimental research would have been a better method to use. Experimental research as a method was not appropriate for us to use because we were more interested in evaluating the usability of our app. This was why we chose usability testing as our evaluation method.

We decided to perform the testing at the Realfagsbiblioteket. One drawback with testing in natural settings is that you can't get as much quantitative data as in using a lab (Lazar et al., 2010). Additionally, we wanted to evaluate the usability of tasks which involved locating and fetching books from the library, which was only possible in a natural setting and not in a usability lab. Our goal for the project is to make it easier to search for and locate books at the Realfagsbiblioteket, and therefore, the library is the only appropriate place to test the app.

The most commonly used measures in quantitative usability testing are task performance (efficiency), time performance (effectiveness) and user satisfaction (Lazar et al., 2010). Each of these was measured as follows:

- o Task performance: How many tasks were correctly conducted?
- o Time performance: How long did it take to perform each task?
- o User satisfaction: Investigated by asking questions after task completion.

5.2 Plan

In advance we made a task list for the users (see figure 5). This was carefully written to ensure that the users would be clearly informed as to what we wanted them to do. The tasks were made in a specific order, because some of the tasks depended on other tasks. We also made sure that there was a clear finishing point in each task, to make sure that the participants would know when each task was completed and they could move on to the next task in the list. If the participants used a long time doing the task, they would be provided assistance if they were stuck. We decided that we wouldn't tell them in advance what we thought would be an appropriate time to complete each task. Instead we would observe their progress and provide assistance if it appeared they were stuck, and would not be able to continue on their own.

INTRODUKSJON:
Vi har utviklet en app for å gjøre det enklere å finne bøker i biblioteket. Målet er å forbedre kvaliteten på grensesnittet ved å finne feil ved det. Vi tester ikke deg som bruker, men selve appen. Det går ikke an å gjøre feil.

OPPGAVER:
1. Søk på følgende bok og finn ut om den er ledig, og marker riktig svar:

<div align="center">JA   NEI</div>

Title	Introduction to renewable energy
Author	Vaughn Nelson
ISBN	978-1-4398-3449-7

2. Finn antall fysiske bøker (ikke e-bøker) som tilsvarer søket «Einstein» og skriv ned svaret: _____
3. Gjør et **søk** på boka med tittel Handbook of cellular metals og finn ut om den er ledig, og legg til i FAVORITTER.
4. **Hent** boken fra oppgave 3
5. **Skriv** ned åpningstidene til Vilhelm Bjerknes hus:

   _____
6. Gjør et **søk** på boka med ISBN nr 978-0-521-19372-6 og finn ut om boken er ledig, skriv ned svaret: **JA**   **NEI**
7. **Hent** boken fra oppgave 6
8. Bruk SCAN funksjonen til å søke på boka som ligger på bordet, og legg til i FAVORITTER
9. **Fjern** begge bøkene du tidligere har lagt til i FAVORITTER

Figure 5: Usability testing task list presented to users

5.3 Users: who, what, where?

In order to test the project, it was natural for us to do a user-based usability test at the Realfagsbiblioteket with students who use the library. We considered it ideal to have real students testing the high fidelity prototype in real environments to get a clear view of flaws and successes of the app. In advance we decided that 5 users would take part in the usability test. Some argue that 7 users is a more appropriate number for small studies, but we felt confident that 5 users would find approximately 80% of problems (Lazar et al., 2010). Some participants in the usability test had experience in finding books, while others had never looked for a book at the

library before. Our participants had different cultural backgrounds - both Norwegians and foreign students - as well as both genders. Having a diverse group of participants helped us ensure that they were as representative of the user group as possible, which in turn maximized our chances of identifying usability problems. Unfortunately, we had no luck finding participants who had visual impairments or other disabilities.

5.4 Requirements for users

The only requirement we had for our users were that they had used an Android phone at some time since our app relies on Android behavior, and that they were users of Realfagsbiblioteket at some level.
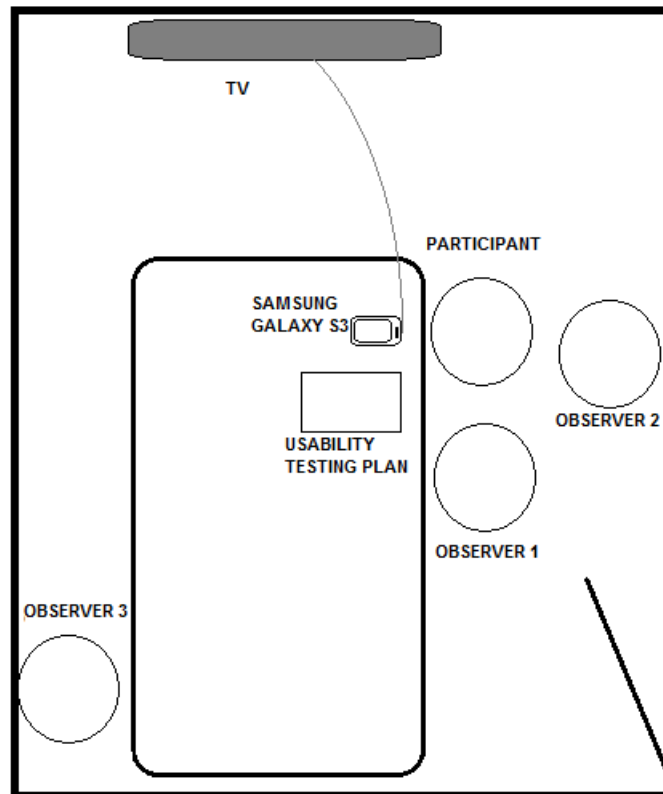

Figure 6: Usability testing setting

5.5 Execution

A pilot study was conducted before the usability testing to make sure that the plan worked well. Necessary changes were made after the pilot and then the usability test was arranged in the library. A group room was reserved for us and we brought all the equipment we needed and tested it, including TV, cables and a Samsung Galaxy s3 mobile phone. When the participants came they received a brief introduction to our project and then were presented a consent form,

which they signed before starting the usability test. It was important for us to let the participants know that we appreciated their participation. Therefore, we made sure they were offered coffee, cakes and fruit, and a gift certificate worth 200 NOK from Akademika. The participants were seated closest to the TV screen, so they could not see it and would not be distracted by it (see figure 6). The phone was connected to the TV, so we could see the phone screen as the participant conducted the test. We were three people in the room in addition to the test person during the sessions. One took the time on each task, one guided and observed the user, and the last person took notes on the participants' progress in task completion. Each session lasted about 20 minutes and we carried out the roles of observer, time-recorder and facilitator in turns. It can be stressful for people to be observed while doing a completely new task (Lazar et al., 2010). We explained thoroughly that we were only testing the app and that they couldn't do anything wrong, and we tried to make it as natural as it was possible to be in that kind of setting.

After completion of the task list, we had a debriefing with the participants, asking them questions about what they felt was difficult to accomplish and what was easy to accomplish. Also, we asked if they had any additional comments.

5.6 Findings

The table shows the 5 participants and the 9 tasks they completed, and how many minutes and seconds the participants used to complete each task. We made sure that every participant was made anonymous and we coded them as #1-5 (Lazar et al., 2010).

	T1	T2	T3	T4	T5	T6	T7	T8	T9
#1	00:42	00:23	--	05:00	00:20	00:45	01:50	00:23	00:09
#2	01:20	00:43	00:35	03:25	00:39	00:55	02:24	00:23	00:07
#3	01:45	00:44	00:57	03:00	00:20	00:40	02:43	00:60	00:15
#4	00:39	00:17	01:00	03:45	00:20	00:25	02:05	00:58	00:40
#5	01:49	02:43	00:43	02:56	00:20	00:61	02:21	01:56	00:17

Table 2: Results from the usability test

5.7 Summary of the usability test

5.7.1 Task performance

When it comes to task performance, all of the participants managed to complete all of the tasks, although someone needed more time than others to understand what they were supposed to do. None of the participants had to abort a task, but some had to start again from the beginning to manage what they were supposed to do. Apart from this, the majority of those who participated in the usability testing managed to complete all tasks without problems.

5.7.2 Performance

The time performance is shown in table 2. The reason for measuring the time spent on each task was to see if there were any big gaps between the users and their time spent, and to see if some of the tasks took very long time. In task 2, we can see that one of the participants used quite a while figuring out where the number of hits was in the search result. As this is a usability test, even a problem encountered by just one user can indicate a usability problem in the interface design that should be fixed (Lazar et al., 2010). In task 8 there was also a participant that used a very long time in understanding what to do. The participant struggled to find out where the scan button was. The other tasks went quite well for all of the participants, and there was no clear gap between the users in the time used for each task.

5.7.3 User satisfaction

Based on the debriefing with the participants, we made a summary of what they liked and didn't like. They liked the search function, the details on the map, the e-book toggle, the scan function and the icons. One thing they wanted to be improved was the shelf system. Several users didn't see the shelf map which shows which level the books were located in. They also mentioned that the map should have the reception labeled to help orient the map, and autocomplete didn't work optimally with long titles.

5.7.4 Results from the usability test

After analyzing and evaluating the data collected we arrived at the following results for the usability test:

What worked well:

- The *icons* are intuitive and recognizable from other apps and websites, and it is easy for users to understand what they represent. Also the users think the icons are appealing and match the rest of the design.
- The library *map* which shows the location of the books works well and has a good level of detail (tables, chairs, shelves etc).
- *Search* function works well in that users find it easy to understand what to type and where to type in order to perform a search.
- *E-book toggle* works well. Most users find it easy to understand how they can include or exclude e-books from the search results.
- Good *learnability:* when using the map function in the app to find, locate and fetch a book in the library, users were able to perform the task faster on subsequent attempts.
- Most participants find *scan* function intuitive, fast and convenient to use.

Usability issues:

Based on the quantitative task performance data and feedback from the users about frustrations during the task session, we identified and prioritized the usability issues as follows:

1 *Orienting the map* - Users had some difficulty in orienting themselves in relation to the map and figuring out which direction to go in. Therefore landmarks in the library should be labeled, such as the reception, the entrance etc.

2 *Autocomplete* - should work with the whole title. Some of the titles are very long and autocomplete currently does not work with entire titles reliably, reducing its utility.

3 *Shelf map* - this is the part of the map that indicates which shelf of a bookcase the book is on, and it is not visible enough and can be confusing. We had given the shelves the arbitrary labels 'A', 'B', 'C' etc which were difficult for the users to understand. Also the shelf illustration itself is too small to be seen easily and the colors do not have enough contrast.

4 *Scan now* button on the help screen for scanning a book - This screen is presented to the users the first time they use the scan function and provides guidance on how to use the scan function. However, some users found it hard to locate the button to start the scanning once they had read the instructions.

5   *Number of search results* on search screen - the text should be larger and more visible.

The above prioritized list of usability issues is intended as a report to the future developers to make further changes in the app. To make it easier to orient the map was our highest priority because it is the main function of our app, also it is easy for the developers to fix. Autocomplete is probably the hardest part to fix, but also it is very important that it works well to provide a good user experience when searching for books, especially when typing long titles. Shelf map is also easy to fix and prioritized as number three. Many of the users found it hard to both locate on the screen and comprehend its meaning. Some of the users found the 'Scan now' button on the help screen hard to find, so that also needs to be fixed, but got priority four as it was only a problem for one participant and we consider it to be a problem only the first time you use the app. Making the number of search results more visible was prioritized last as it is not essential to the primary purpose of the app.

5.8 Reflections on the usability test

As we can see in the usability plan, we repeated the task where the participant needs to locate and fetch a book using the app. The reason for this was to see if they had learned something from the app the first time they used it to locate a book from the library. If they were quicker in performing the task the second time around, it might indicate that the app has high learnability and memorability. In the results, we found that all of the participants used less time locating and fetching a book on the second attempt (see table 2, compare T4 and T7). Everyone used less than three minutes doing this task. We interpret this as indicating that the app was quite easy to learn.

We had some problems with the internet connection during the usability testing. This may have created some bias in our results, in terms of the time spent on each task. It was also difficult to know exactly when to start and stop the timer for each task. This was because we refrained from speaking to the participants during the testing, so as to minimize any potential impact on their performance. Unfortunately this led to missing the recording of the time for one of the tasks.

It's possible that we could have had even more data about the interface if we had performed usability testing on different devices. We could also have gathered more valid data if we had

conducted summative expert-based usability testing as well (Lazar et al., 2010). Though we had earlier conducted formative expert-based usability tests, due to time constraints were were not able to do so during the summative evaluation.

6. Conclusion

The goal of our project was to make it easier for users at Realfagsbiblioteket to search for and locate books at the library. Based on our observations of the current usage patterns of users, we found that several participants found it difficult to use the current BIBSYS system on the library website. Everyone we interacted with in the project was positive about the app and the participants in the usability test gave us feedback that the app was easy to use. Hence we feel that the design of the app meets our goal.

If we had had more time we would have worked with a broader user group, fixed the flaws from the first usability test and conducted a new round of usability testing. This would helped us get feedback from a broader user group and located more potential problems with the app. This would have given us more reliability and validity in our data, allowing us to get closer to a product ready for public release.

This app is still a prototype and there is a lot of work required to make this a fully functional app. We would suggest for the further development that the app be implemented for all platforms, provide a secure login and related functions, offer several languages and the book-map system should be made more dynamic than it is today. As earlier mentioned, there is also scope for extending the app to work with other libraries in Norway.

Our client has informed us that they are pleased with our progress, and has expressed interest in continuing to work with us next semester to further the project and make it available for students to use.

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